International Multidisciplinary Scientific GeoConference Surveying Geology and Mining Ecology Management, SGEM 2016 vol.1, pages 469-474

Paleogeographic factors of the formation of Permian reservoir rocks of bitumen deposits in the east of the Russian plate (Russia)

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Abstract

© SGEM2016.At the Permian period in the east of Russian plate took place a change of sedimentation regimes, caused by changes in paleogeographic conditions. Among the Permian deposits there are various sedimentary formations, which were formed in different climates (evaporite sulfate-carbonate, coal-bearing, gray-colored marine sediments, red beds, etc.) Different types of minerals relate with them such as gypsum, coal, copper sandstones and shales, bitumen. Recently, interest to the bitumen is increased, because they are valuable multipurpose and multifunctional feedstock (fuel, oil, etc.). They have significant resources in the Permian sediments, which can range from 1.5 to 10 billion tons. Bitumen deposits belong to the sandstones of Ufimian (Kungurian – ICS) stage (sheshminskiy horizon) of Permian period. Bituminous sandstones are cross-bedded, small- or medium-grained, polymictic. They locate at small depths from the surface up to 400 m. In spite of long-studying history of Permian deposits, problems of origin of reservoir rocks and genesis of bituminous substances remain debatable. We studied sandstones by methods of optical microscopy, electron paramagnetic resonance (EPR) and electron microscopy. Petrographic studies have shown that the mineral composition of all the studied sandstones belong to the graywacke group. Clastic material consist grains of quartz, feldspar, mica, and particles of volcanic rocks. Clastic material is poorly rounded and poorly sorted, which indicates a minor scale of its transfer. For a number of signs formation of sandstone occurred in a coastal marine facies. This is indicated by presence in rocks coalified seaweed residues. Geochemical studies have shown elevated concentrations of a number of trace elements in the bituminous rocks. That can be explained by their geochemical contrast relative to the surrounding red beds. One of the most important fundamental issues is the genesis of the bitumen substance. According to popular view, the source of oil fractions is underlying oil deposits in Carboniferous. Vertical migration of oil could occur by the system of tectonic faults and fractures as a result of tectonic stresses aroused during the formation of the South Tatar arch. Linkage of Permian bitumen deposits with Carboniferous oil deposits is confirmed by their combinations in plan. They also have similar features of composition. Bitumen substance as well as carboniferous oil and coal have a high content of sulfur. This feature distinguishes them from occurring below Devonian oil and, obviously, it is the result of the formation specificity.

http://dx.doi.org/10.5593/SGEM2016/B11/S01.059

Keywords

Bitumen, Paleogeography, Permian, Sedimentation